ID

Distr.
LIMITED

ID/WG.444/2
18 June 1985

ENGLISH

United Nations Industrial Development Organization

Forum on the Involvement of NGOs in the Implementation of the Programme for the Industrial Development Decade for Africa *

Abidjan, Ivory Coast, 27-30 August 1985

THE INVOLVEMENT OF NGOS IN THE DEVELOPMENT OF THE AGRICULTURAL MACHINERY INDUSTRY IN AFRICA**

Prepared by

M. Béavogui ***

---

* Organized by the United Nations Industrial Development Organization (UNIDO) in co-operation with the Association of African Development Finance Institutions (AADFI).

** The views expressed in this document are those of the author and do not necessarily reflect the views of the secretariat of UNIDO. Mention of firm names and commercial products does not imply the endorsement of the United Nations. This document has been reproduced without formal editin.

*** UNIDO consultant,Director a.i. Department of Design

V.85-28321

Table of Contents

		Page
I.	Introduction	1
	1. Demand for Agricultural Machines and Implements in Africa	1
	2. Local Production	2
	3. Importation	5
	4. Relationship between Needs Production Import	5
II.	Present Status and Involvement of NGOs	7
	1. General Status of Development of Agricultural Machinery	7
	2. Major Constraints hindering the Development of Agricultural Machinery	13
	3. Areas in which NGOs are more Active	16
	4. Linkage between R+D Activities and NGOs	20
	5. Major Problems faced by African NGOS and Possibilities of Co-operation with International NGOs	21
III.	Conclusion and Recommendations	23
	1. At National Level	23
	2. Regional Level	25
	3. Co-ordination of Activities with IGOs	25
	4. The Role of UNIDO	27
B I B L I O G R A P H Y		29

I. Introduction

According to FAO sources, the population of Africa which was estimated in 1980 to be 370 million will attain the figure of 688 million in the year 2000. The same sources pointed out that the Continent will need 49 million more tons of cereals. To attain at least part of its food self-sufficiency target, the Continent needs to develop, among other inputs, the promotion of a national agricultural mecanization. This will need an optimum selection of types of machines and equipment judiciously interrelated with the human factor, the soil and the water, the ultimate goal being the improvement of productivity, elimination of hard labor, creation of job opportunities, and amelioration of the conditions of living in rural areas. Unfortunately, the production of agricultural machinery and implements in Africa is in crisis, due to the fact that it is directly interrelated with agriculture and industry, two areas undergoing tremendous difficulties. African manufacturers of agricultural machines and equipment have been complaining that the major constraints which hamper their activities have been a mainly unorganized demand which is basically satisfied through importation. But it should be noted that the major characteristic here is the gap between the real needs of African farmers and the actual level of consumption, i.e. the difference between the real demand and the apparent demand.

1. Demand for Agricultural Machines and Implements in Africa

It is very much difficult to identify the needs of agricultural machines and implements in Africa. The main reasons for this situation are: (a) lack of information on local production, (b) incompleteness of statistics, (c) non-identification of many implements used in agriculture. A study carried out by UNIDO on 16 countries confirmed:

- a very low level of production;
- big fluctuation of imports;
- big percentage of motorized equipment in the overall importation of agricultural machinery.

The study was based on sample countries for each sub-region: North Africa - Algeria, Egypt, Sudan; West Africa - Ivory Coast, Mali, Nigeria, Senegal, Togo; Central Africa - Burundi, Cameroon, Zaire; Eastern and Southern Africa - Ethiopia, Kenya, Madagascar, Tanzania, Zambia.

In North Africa the demand of agricultural machinery is essentially related to motorized equipment. This equipment is partially manufactured locally. The growth of the demand for motorized equipment is due to the policy of incentives to mecanized agriculture. Hand tools and animal-drawn implements are basically supplied by local blacksmiths and small artisans in North Africa. Exception is made with Sudan which is having a growing import of hand tools.

The demand in West Africa is essentially associated with animal-drawn implements and, to a lesser extent, motorized equipment, with the exception of Nigeria. This motorized equipment is required by rich private people, agro-industrial firms, cooperatives and governments. The demand for animal-drawn implements may increase if proper incentive policies are introduced and production of animals encouraged. The actual tendency shows the willingness of many West African governments to mecanize agriclture through animal-drawn implements. Despite the absence of statistics, one can assume that there is a substantial consumption of hand tools since mecanization is very low in the agriculture of the sub-region.

The demand in Central Africa is dominated by hand tools. Animal-drawn mecanization is relatively absent and power-operated machinery use is very low. Big plantations and small farmers prefer to use high quality tools manufactured in modern production units like TROPIC in Cameroon or Chanimetal and UMAZ in Zaire, instead of those manufactured by local artisans and blacksmiths. An increase in the importation of these implements, particularly from Asia, has been noticed.

The demand in Eastern and Southern Africa concerns hand tools for small traditional farmers, animal-drawn implements for middle level farmers and power-operated equipment for large scale farmers or government plantations. The use of animal-drawn implements has been growing in the sub-region, particularly with the promotion of agricultural development projects.

2. Local Production of Agricultural Machines and Equipment

Besides imported equipment, African farmers are supplied by Agrican urban manufacturing industries and local blacksmiths and artisans. African industry offers a wide range of equipment, from simple tools to complex machines like tractors. But in many countries these industries are undergoing very harsh financial and technical difficulties.

Table 1

Importation of Agricultural Machinery in Developing African Countries - 1973-1979

Year	World Trade	Importation of Developing African Countries (in thousands US)	Equivalent part of World Trade %
1973	4 343 896	219 687	5.1
1974	5 997 526	329 936	5.5
1975	7 979 778	532 749	6.7
1976	8 007 736	483 489	6.0
1977	8 857 586	609 321	6.9
1978	9 734 685	738 739	7.6
1979	11 879 868	487 104	4.1

Source: UNIDO series of Sectoral Studies
(United Nations Bureau of Statistics)

Table 2

African sources of importation for agricultural machinery

(in thousands of dollars)

Importers	Exporters								
Sub-region Country	Western Europe	US & Canada	Other Developed Countries	CAEM	Developing Countries	African Developing Countries	Sth Afr.	Others	World
N. Africa	200,595	14,195	5,361	11,833	2,603	352	-	1,230	236,172
Algeria	32,722	3,247	1,485	3,340	763	283	-	10	41,891
Egypt	10,144	1,441	360	6,948	163	-	-	-	19,069
Sudan	14,028	5,689	37	285	1,654	18	-	-	21,713
West Africa	56,337	24,632	10,763	240	3,963	705	-	1,087	97,731
Ivory Coast	14,647	10,939	2,623	-	569	63	-	1,087	29,931
Mali	2,663	188	17	-	-	16	-	1,087	2,885
Nigeria	19,009	6,263	2,900	-	982	2	-	-	29,158
Senegal	2,781	750	34	-	51	-	-	-	3,610
Togo	1,357	166	4	-	-	5	-	-	1,534
Central Afr.	18,757	17,304	632	104	91	931	-	320	38,150
Burundi	465	239	-	-	-	-	-	-	706
Cameroon	11,789	9,316	348	93	91	597	-	329	22,566
Zaire	3,456	778	140	-	-	7	-	-	4,377
Eastern and Southern Afr.	74,047	19,019	10,366	5,744	3,195	893	1,780	-	115,040
Ethiopia	7,868	382	1,885	5,658	102	-	-	-	15,897
Kenya	15,340	1,540	2,686	-	688	-	-	-	20,557
Madagascar	6,049	2,517	590	85	62	105	-	-	9,411
Tanzania	12,684	2,537	2,767	-	689	11	-	-	7,892
Zambia	6,531	760	132	-	-	468	-	-	7,892
Total Africa South of the Sahara	163,170	66,645	21,800	6,374	8,905	2,549	1,780	1,417	272,645
All Developing Countries Africa	349,737	75,151	27,124	17,922	9,855	2,822	1,780	2,647	487,104
LDCs of Afr.	66,174	18,623	6,535	6,184	3,974	1,182	1,720	-	104,997
Total Africa	442,634	122,484	38,138	17,922	22,004	2,883	1,780	2,647	650,496
Total World	6,343,628	3,567,153	765,984	930,990	228,679	4,522	10,708	28,200	11,879,868

Source: United Nations Bureau of Statistics
UNIDO Series of Sectoral Studies

Blacksmiths and other artisans, although numerically the most important, are limited to the production of simple hand tools. The share of these two groups of suppliers on the African market is less than 10%. (This figure is far lower when we consider Africa south of the Sahara). For the whole of Africa (except the Republic of South Africa), the total production of urban industries is estimated at US$150 million per annum, meeting only 10% of total requirements. But the interesting fact to be noted here is the high level of specialization at sub-regional level, explained by the similarity of ecology and agricultural techniques. The production of equipment by artisans can be defined at three levels: the traditional blacksmiths, the modern blacksmiths and the artisans-mecanics.

3. Importation of Agricultural Machinery and Equipment

According to statistics, Africa spent US$650 million annually between 1976 and 1979 to import agricultural machines. 65% of these machines are tractors. If other motorized equipment used in agriculture is added this percentage can reach 90%. Table 1 shows that the African market represents only 5% of the world market compared to its population - this figure is just too low. This phenomenon explains why many multinationals hesitate to involve themselves in the African market. Except for hand tools, the main suppliers are Western Europe (72%) and the United States (15%). Inter-African trade of this equipment is limited to 6% only, while South-South supply is estimated at 2% (see Table 2).

4. Relationship between Needs, Production and Import

There is no African country which has achieved self-sufficiency in agricultural machinery. Moreover, locally manufactured equipment includes up to 60 to 80% of imported components (raw materials, special parts). Tractor manufacture is limited to the assembly of basically imported C.K.D. or S.K.D. The apparent demand for agricultural machinery is estimated at US$1.5 million per annum, representing only 15% of total import of capital goods. Within Africa, the North African sub-region attracts 50% of the needs of African developing countries. Eastern and Southern Africa comes second with 33%, followed by West Africa 20%. Central Africa counts only for 8% of the total value of imports. The biggest importers in Africa are: Algeria 6%, Cameroon, Kenya and Sudan 4,5% and the United Republic of Tanzania 4%.

It has already been pointed out that 65% of this equipment is power-operated; 80% is bought by the big farmers, while the rural population acquires less than 5%. In other words, majority of Africans (peasants and village communities which account for more than 70% of the population) are getting less than 5% of the total value of expenditure in foreign currency by governments, as far as agricultural machinery is concerned. Such an imbalance can lead only to the aggravation of the fundamental under-equipment of traditional agriculture and rural activities, consequently affecting negatively the success of the agricultural sector and encouraging rural exodus.

It is clear that the nature of supply and demand interrelationship is determined by the degree to which the design of machinery and equipment takes into account the requirements of the user, the performances expected, the conditions of use, the possibilities offered by the local production structures, and the materials available. Appropriate design could also lead to the reduction of maintenance operations and technological dependence.

It is therefore vital for Africa that the present trend be corrected. UNIDO has been working towards this objective through subsequent meetings and projects at national, sub-regional and regional levels. African leaders have as well admitted the challenge put forward for the development of agriculture, agricultural mecanization and supply of agricultural machinery in the Lagos Plan of Action. The Plan insisted on the necessity to produce locally and in sufficient quantities agricultural machinery and equipment in order to reduce dependence on the industrialized world. The document further expressed that this production should be achieved within the framework of an industry working towards the satisfaction of the fundamental needs of the society and its modernization. In order to accelerate the achievement of these objectives, the Lagos Economic Summit adopted the years 1980-1990 as the Industrial Development Decade for Africa (IDDA). The objective of this paper is to find ways and means to promote and rationalize the role of non-governmental organizations (NGOs) in the development of agricultural machinery and equipment within the context of the IDDA.

II. Present Status and Involvement of NGOs

1. General Status of Development of Agricultural Machinery

The general outlook of agricultural machinery industries in Africa is broadly based on the manufacture of simple tools, implements, simple agricultural pre and post harvest machinery. Complicated agricultural machinery and equipment are in most cases imported from developed countries. However, the nucleus engineering industries, still at their formative stage, participate in the fabrication work, sub-assembly/assembly operations and, in very limited cases, spare parts manufacture for tractors as well as processing and storage facilities of a complicated nature. As already stated, local supply of hand tools, agricultural machinery and equipment in Africa is undertaken by the following groups of manufacturers:

- The local blacksmiths
- The small artisans
- The small-scale urban manufacturing units
- The large and medium-scale assembly plants

a. The Local Blacksmiths

Village blacksmiths exist in all African countries and still continue to supply their communities with hand tools such as matchets, hoes, etc., as well as different products needed for daily ordinary living in rural areas. This group of people is characterised by the following:

- The equipment they use is limited in quantity and quality. Usually, that equipment is manufactured by the blacksmiths themselves. It should be noted that a new generation of modern blacksmiths is coming up with an increased use of equipment manufactured by modern industry such as shears, special players, etc.

- The training is usually done on-the-job and knowledge is transmitted from father to son.

- They are generally scattered in rural areas, but sometimes grouped in places.

- They devote part of their time to agricultural work for their feeding. The traditional blacksmiths usually have their market in hand except for some widely imported products, such as matchets.

b. The small artisans

Apart from items like burglar proofs, metallic chassis, decoration moulds, the small artisans also produce hand tools and simple implements. They are more frequently established in urban peripheries. Small artisans' workshops are characterized by the following:

- The use of simple equipment and tools produced by industry: spanners, trade cutters, players, gas welding and electric welding.

- Their training is carried out on-the-job and seldom through trade schools.

- They are located in semi-urban or sub-urban areas.

Case studies show an increasing number of these small artisans not only in the maintenance of complex machinery, but also in the manufacture, in small series, of simple adapted equipment for farmers. They usually work individually, although there are examples of collective production either organized by the artisans themselves or initiated by governments.

c. The small-scale urban manufacturing units

There are a number of small urban manufacturing units in African towns using ordinary electrical machine tools and equipment. The major part of their production is geated towards the manufacture of tools and agricultural equipment. During the past ten years, the organization of manufacturing networks between these units and small associations of artisans has been carried out mainly for the production of animal-drawn implements, ploughs, harrows and farm carts (COBEMAG in Benin and COREMA in Burkina Fasso). Besides finished products directly manufactured in the units, semi-finished products are as well manufactured in order to be distributed to rural artisans' workshops. The latter proceed with finishing, i.e. assembly and painting. Another approach used is to sub-contract manual sub-assembly operations to artisans before the product is finished in the main manufacturing unit.

d. The medium and large-scale plants

These are usually assembly plants, generally branches of multinational companies set up to assemble semi knock down components and produce heavy machinery as tractors, bulldozers, etc. The components are imported and production is done under licence. These types of plants exist only in big African countries like Algeria, Egypt, Nigeria, Zaire, etc. The staff are usually trained by traditional schools supplemented by in-house training in the plants' facilities. Specialized skills are developed in the facilities of

that multinational in Europe. Management and organization set up is always developed by the mother multinational companies. The use of sophisticated hand tools and handling equipment is frequent while a fairly well equiped machine shop is also available.

Having defined the categories of manufacturers of agricultural machinery and equipment in Africa, the following step will be to study the status of their development under the following classification:

- by types of utilization
- by types of energy consumption

II-1-1 Development of agricultural machinery according to type of ulitization

According to mode of utilization, agricultural machinery and equipment can be divided into four groups: agricultural seed, harvesting, post harvest processing and storage equipment. Each of these groups will be studied below according to the type of energy used to operate them: hand-operated, animal-drawn and power consuming engines, see table 3.

a. Agricultural Seed

These are soil preparation equipment, planters and sprayers.

Hand-operated: Hoes, matchets and planting sticks are manufactured and used at village level since years and years. They still are basically produced by blacksmiths and small artisans. The designs have practically not changed, only the variety in sizes has increased. The failure to find steel alloys capable of competing with those used for imported tools has led to the smiths giving up gradually producing some items like matchets. Certain urban workshops produce these items under licence. Sprayers are practically all imported while planters are manufactured by artisans or urban industries equiped with cutting and welding instruments using imported designs.

Animal-drawn agricultural seed equipment is widely produced in Africa by small urban industries and small artisans. The items are ploughs, harrows, ridgers, cultivators, planters, sprayers. The basic designs of this equipment are imported, in other words, the equipment actually manufactured locally is made from adapted designs. In general, there are two methods of manufacturing:

i. Forging, i.e. hot benging of a semi-hand mass of steel. Holes are drilled by machine. Handles and stilts are made by bending flat bars which are riveted or bolted to the ploughbeams. Equipment obtained by this method is light and well proportioned.

ii. Cutting and welding rectangular or circular tubes with flat bars. Final assembly is carried out using bolts. The frames in this case are angular in appearance and somewhat heavier. In the face of the fast performance achieved with arc welding, forging seems to be less favoured. In almost each African country these implements are manufactured using one of the methods described above or a combination of the two.

Agricultural seed equipment operated by Power Consuming Engines usually consists of tractor drawn disc and mouldboard plough, ridger, harrow, cultivator, planters and seed drills, sprayers,etc. Like the tractor itself, this equipment is usually only assembled at local level from imported completely knowk nown components. The designs of this equipment are those of the mother multinational companies. However, it should be noted that the majority of this category of equipment is being imported. Local assembly is only done under licence.

b. Harvesting Equipment

Hand-operatéd harvesting equipment include matchets, harvesting sickles for grains and hoes, used to lift roots of crops. These are manufactured by blacksmiths, artisans and small urban industries. As in the case of hand-operated agricultural seed equipment, the quality of the products manufactured by blacksmiths and artisans is low. This is due to the poor quality of the material and equipment used, as well as skills of the craftsmen. Research is going on to close the existing gap of semi-mecanized equipment which could help and reduce the difficulty of harvesting tubers: cassava lifter in IITA*, cocoa harvester in ARCEDEM*, coffee harvester in the Ivory Coast are examples of developments in this connection.

Animal-drawn harvesting equipment are limited to root crop lifters designed like a plough to dig out the matured products. No other types of animal-drawn harvesting equipment is known to be developed or under developed in Africa.

Engine-operated equipment for harvesting of crops are combined harvester for grain and root lifters. These are usually sophisticated in design and manufacturing as well as in operation. The production of power-operated harvesters is limited to assembly in virtually all African countries.

c. Post Harvest processing equipment: These include threshers, shallers, huskers, grinders, millers, driers, boilers, presses, etc. Modern artisans and small urban industries produce hand or foot-operated food

---

* IITA: International Institute for Tropical Agriculture
* ARCEDEM: African Regional Centre for Engineering Design and Manufacturing

Table 3: Locally Manufactured Agricultural Machinery and Equipment

	Mode of Utilization / Type of energy Consumption	Hand-Operated	Animal-drawn	Power-Consuming Engines
I.	Agricultural Seed	- Hoe, planting stick - Hand pushed planter - Sprayer	- Plough - Harrow - Ridger - Cultivator - Planter - Sprayer	- Disc plough - Mouldboard plough - Ridger - Harrow - Cultivator - Planters and Seed drills - Sprayers
II.	Harvesting	- Matchets and Harvesting knives - Sicles - Hoe - Root lifter	- Root lifters, i.e. groundnut lifter	- Combine harvester - Roots harvester
III.	Post Harvest Processing	- Threshers - Shellers - Grinder - Drier - Boiler - Press	- - - - - -	- Threshers - Sheller - Husker - Grinder - Miller - Drier - Boiler - Press
IV.	Storage Equipment	Improved traditional storage	-	Silles with humidity control

processing equipment. These are usually adapted from Asia or Latin America, although the development of local design is being promoted. The aim is to reduce labour and increase productivity with a limited capital input. IITQ, ARCEDEM and many other institutions at national level are working in this field in order to increase productivity with the use of very simple equipment.

Stationary equipment with ancillary motors of this category are produced in small or medium-scale urban industries. It should be noted that not many countries are involved in the manufacture of these types of equipment. Most of the time the engines are imported. In Algeria, Egypt, and Zimbabwe they are assembled under licence. CENEEMA in Cameroon (Centre for Study and experimentation in agricultural machinery) has developed threshers and winowers from IRRI. SISMAR in Senegal has successfully developed decorticators and shellers now produced in many other West African countries.

d. Storage equipment: Improved traditional storage equipment is still under development and efforts are being made to promote traditional storage systems as well as introduce new methods of binding simple low cost storage facilities.

Fabricated sillos from sheetmetal and with humidity and temperature control equipment are being imported intensively in Africa. These have proved not to be adaptable to tropical conditions. Unfortunately no major research is known to be going on for the development of the right facilities for long-term storage. It is believed that fabrication techniques available in Africa are adquate for the production of sillos. Blowers and fans could as well be manufactured locally while electric motors or engines could be imported to complete the units.

II-1-2 Development of tractors

Simple tractors of less than 30 H.P.

Certain attempts to develop and produce small tractors locally have been going on since some years, with a varying degree of activity. The Tinkabi tractor in Swaziland and the PANGOLIN in the Ivory Coast stand for examples. However, various reports (see A.K. Mitra, Swaziland report on Tinkabi) seem to show very poor performance of the tractor to justify its price. These machines were planned for local manufacture, provided that engines, geat boxes, wheels and hydraulic components can be imported.

In fact, manufacturers in industrialized countries have stopped producing these models since the 1950's and left over such as little Fiat 300 which may be suitable for use on Savannah type terrain will not work in forest or flooded soils. There are virtually no multi-purpose mini tractors

suitable for all types of soil. Consequently the market for low-powered tractors is relatively small, thus affecting their development. But the problem of a limited market can be eliminated if they are manufactured in a multi-purpose production workshop or network that concentrates on a wide range of equipment, provided that no special and costly equipment is required to manufacture the tractor.

Heavy agricultural tractors

Local manufacture of heavy tractors is handled by medium and large scale production units. The production of these tractors includes entire assembly of imported CKD or SKD under licence. Countries like Nigeria, Algeria, Egypt, Zaire, Zimbabwe and Cameroon are leading in this field of manufacture. There is a lot to do for the organisation of the local manufacture of at least some simple parts.

Another interesting line of manufacture which could be undertaken is the one for satellite equipment to the tractors: welded frames for cultivators, tillers, farm trailers since these represent tenths of the price of the main machine.

II-2 Major Constraints hindering the Development of Agricultural Machinery

A healthy agricultural machinery industry can only exist in symbiosis with a healthy agricultural industry. This is true since only that sector of farming which is above subsistence level provides any significant prospect for sales of agricultural machinery and equipment. To analyse the problems affecting the development of agricultural machinery, two groups of manufacturers will be considered. They are artisans (including blacksmiths) and urban industries.

II-2-1 Artisan Production

Various problems have been observed to commonly affect production under this category:

a. Lack of adequate supplies of raw materials: The production depends on supplies of new or scrap raw material from nearby towns or cities which in most cases are irregular. Supplies are made on a daily basis without any storage or group purchase facilities hence without the possibility of earning discounts on bulk purchase. Consequently, final products are expensive and often of poor quality.

b. Lack of finance and non-access to financial facilities

Artisans consume their daily incomes and do not use any revolving fund or capital. With the difficulty of generating sufficient incomes from maintenance services, they prefer to sell finished products. Financial resources

are practically always scarce since most of them don't have access to credit facilities.

c. Inadequate market outlets: The quantity of orders is too low, and the markets are irregular. Orders for one outlet are very diverse and each client presents a particular problem and hence standardised manufacture of a product is impossible. Moreover, artisans are now facing an increasing competition of industrially manufactured agricultural equipment from importation as well as local manufacture.

d. Lack of training: Artisans lack adequate training which could allow them to reduce time of manufacturing without affecting the quality. In most of these workshops application of jigs, fixtures and other production facilities is very limited thus affecting the productivity and quality of final products. Any improvement on quality as a result of new inputs like supply of designs is limited since this is linked with greater time spent.

e. Diversity of occupation: Many artisans have to as well farm to feed their facilities. This state of affairs creates a situation whereby the artisans don't concentrate on their crafts. Some of them are also small merchants.

f. Insufficient or absence of institutional support: Activities, organisation and problems of artisans are ignored by many national authorities. Rare are those countries having an institutional framework to promote rural artisans; and where it exists, it is only for urban-based artisans. Village blacksmiths, the most important in number, are left to themselves.

II-2-2 Urban Industry Production:

Practically all urban indus-ries are facing two types of difficulties: structural and financial. Today, these difficulties are such that many agricultural machinery and equipment manufacturers run the risk of disappearing.

Structural difficulties: Industrial production companies located in African developing countries lacking industrial infrastructures and transport have to face following problems:

a. Lack of adequate supply of quality raw materials and semi-finished products, for example special steel and specially forged or mechanical parts. In fact, supplies of raw materials are often delayed, and 6 to 9 months could be spent between placing the order and receiving the goods.

b. Lack of a developed capital goods sector and maintenance facilities: All manufactured machinery and equipment are imported. Consequently, spare parts are difficult to get and maintenance is therefore affected. It is also difficult to organise a network for maintenance and supply of spare parts. The market is scattered and far from production facilities, and road infrastructures are poor.

c. Unavailability of a locally trained man power, i.e. technicians, workers, etc.

d. Lack of design and adaptation capabilities: Including for engineering groups at national level, there is a complete absence of a capability to design or adapt agricultural machinery to suit local demand and available manufacturing facilities.

e. Inadequate system of assistance and promotion of small-scale industries and absence of institutional framework for this purpose.

Financial difficulties

The difficulties at the level of the marketing constraints cannot be overemphasized, and are characterised by the following:

a. The market capacities are limited, since the products are sold only at national level. Intra-regional trade is almost non-existent. Market outlets are further made difficult by the wide diversity of equipment demanded for manufacture. As a consequence, the quality of each equipment to be produced is reduced, adversely affecting possibilites of large-scale manufacture.

b. The insolvency of the rural population, aggravated by the reduction of their incomes. Besides, governments do not devise any efficient policies to help resolve some of these difficulties. Financial assistance to agriculture remains low. Prices of agricultural products are kept low. Incentives for the purchase of equipment are low.

c. Lack of stable market: Frequent changes in agricultural policies, changes of policies on importation, imports in a framework of bilateral inter-governmental arrangements, frequent reshuffles of companies are some of the factors that account for such a situation.

d. High cost of equipment: The increasing cost of steel which doubled between 1974 and 1978, as well as capital goods, energy and consumable industrial products, coupled with poor management, led to a high cost of agricultural

machinery and equipment. In fact, manufacturers had to increase the price of products to cover ex-factory costs in such a way that they go beyond the financial capabilities of their customers.

II-2-3 Sociological Constraints

At the manufacturing level, blacksmiths are still remaining very conservative and reluctant to use modern equipment and technology. They sometimes reject welding or vertical forgings. Poor management has also been a major constraint to urban and small-scale manufacturers. If they are of the public sector, their managements are careless, which characterizes a majority of African government companies. It is usually considered that anything belonging to the government does not belong to anybody in particular.

On the user's side, the awareness of a culture based on the use of machines is still absent in many African farmers. A majority of them are practising the subsistence agricultural system, using hand tools. A sudden change in farming techniques by the use of sophisticated equipment would only create more problems.

II-3 Areas in which NGOs are more active

The Fourth General Conference of UNIDO requested the Secretariat to strengthen further its coordination role not only with organisations of the U.N. system and other relevant governmental and inter-governmental organisations but also with non-governmental organisations whose work is related to the development of industry.

In accordance with UNIDO programme of cooperation with non-governmental organisations, these are classified as follows:

- Regional, sub-regional and national NGOs
- Chambers of Commerce and Industry
- Industrial Associations
- Financing and Banking Institutions
- Universities
- Research and Development (R and D) Institutes
- Cooperatives
- Trade Unions
- Other non-governmental organisations (religious associations/clubs, etc.)

Being at international or national level, non-governmental organisations play a certain role in the industrial development of their respective regions. However, there is limited information in connection with their activities. In order to study their impact on the development of the agricultural machinery industry, we would consider the following areas: design, production and marketing, repair and maintenance of equipment and training of personnel.

Design: In many African countries universities and R and D institutions carry out a lot of research work in the field of design, development and testing of agricultural machines and equipment. Unfortunately, this work relates more to the theoretical than the practical aspect, that is giving answers to the real needs of farmers and manufacturers. A lot of prototypes exist today in faculties of engineering and/or technology, but they have never been manufactured commercially, because of the missing link between universities, R and D institutions and manufacturers.

At the international level, institutions like the International Institute for Tropical Agriculture (IITA) are also working in the design and adaptation of agricultural equipment. For instance, IITA has developed an injection pilling planter adapted to minimum tillage system. This planter has performed satisfactorily in a number of African countries. Samples of single and double row planters are now successfully being utilised in Nigeria, Cameroon, Burkina Faso for maize, beans, cow peas, etc.

However, the effort to get this equipment widely manufactured has been unsuccessful. Most of the time this equipment is handed over to governments who in turn pass it to local manufacturers for the construction of a fixed quantity. The lack of contact during manufacturing between the manufacturer and the designer, i.e. IITA, leads to a poor quality of the finished product, resulting in a bad performance of the planters in the field. Consequently, the planters are rejected by the farmers in the following planting season. For obvious reasons, financial and banking institutions decline to give any direct support to research in almost all African countries.

Production: Industrial associations, Chambers of Commerce and cooperatives play a significant role in the industrial production process in general, and agricultural machinery production in particular. Industrial associations such as Metal Engineering Industries Development Association (MEIDA) in Tanzania

have facilitated the production of matchets in some industries in Tanzania through the development and production of dies, punches, jigs, and fixtures. The association has also enabled production of plough shares from rejected and/or old rail line materials.

Two groups of cooperatives, i.e. cooperatives of modern blacksmiths and cooperatives of artisans are involved in the production of agricultural machinery in Africa. In countries like Kenya, Nigeria, some private financial and banking institutions assist the production of agricultural equipment through these cooperatives although it is difficult to get such facility due to complicated bureaucratic and very rigid conditions.

In countries like Tanzania and Sierra Leone, religious bodies like Christian associations (R.C.A.) have some workshops in which simple equipment is manufactured. The Agricultural Experimental Station in BO, Sierra Leone, under the auspices of the Methodist Mission for example, produces cassava graters which have been successfully sold in the country. However, the lack of good designs and manufacturing capabilities is affecting the quality and performance of their production.

Marketing: Industrial associations and Chambers of Commerce promote the marketing of agricultural equipment through trade fairs and exhibitions. The major constraint for promotion of sales of agricultural equipment is the lack of circulation of information. Besides trade fairs and exhibitions, there are almost no other means of communication to inform the public of the availability of equipment in the local market i.e. pamphlets, advertisements, etc., since these require knowhow in advertising techniques. When available, these techniques are too expensive for monetary facilities available to the producers. Very often, spaces in trade fairs are too expensive. It is suggested that financial institutions as Banks of Commerce and Industry, Religious and Industrial associations finance the participation of small manufacturers into trade fairs, as well as assist in the preparation of pamphlets and other advertising documentation.

Repair and Maintenance: One of the biggest bottlenecks hampering the development, manufacture and utilization of agricultural machinery and equipment is the lack of proper repair and maintenance facilities, as well as adequate skills for the same purpose.

Usually, maintenance is organized by the individual organisations. In case of a fault necessitating high technical knowledge, outside specialists are called in. Since some of the components are not produced locally, repairs are often delayed.

As most of the capital goods used to produce equipment are procured abroad and for other reasons, spare part supplies are hardly regular, resulting in unnecessary delays in production. Maintenance systems are usually inadequate.

Chambers of Commerce and Industrial associations do sometimes organise seminars to assist in promoting maintenance standards. It is suggested that these seminars be organised more frequently and designed in such a way as they would have an impact on the users. Instead of inviting officials to discuss maintenance, it is better to organise discussions with technicians directly involved in the maintenance process. In Tanzania, the Tansanyike Farmers Association (TFA) centralises the needs of spares of different members in order to place bulk orders from foreign suppliers. This approach should be encouraged since it reduces the burden on individual manufacturers and enables them to save time and money. The international NGOs should also assist in setting up facilities for the storage of spare parts and upgrading maintenance techniques.

Training: Many non-governmental organisations are involved in the teaching of mechanical engineering skills which are basically required in agricultural machinery and equipment manufacture. Industrial associations, Chambers of Commerce and trade unions organise short seminars mainly aimed at improving productivity and marketing, and also sponsor trainees in different trades and other specialisations. International NGOs sponsor the training of staff through national NGOs or governments, as well as through arranging industrial attachments overseas.

Religious associations often have Vocational Trade Schools, which teach different technical skills like machining, welding, blacksmithing, metal forming, carpentry, etc. Although these arrangements are relatively successful compared to actual needs, they still appear to be insufficient. It is suggested that these kinds of schools be promoted in rural areas to train young people. Training programmes should aim at creating a spirit of self-sufficiency, self-employment and/or collective employment in the trainees.

University programmes in most African countries are not usually adapted to national industrial needs. Moreover, it is not possible to orient the students to narrow specialisation demanded by industries in the present age of competition. While the graduates on completion of university courses possess fairly wide-based theoretical knowledge, they require industry-oriented training in specialised fields like design, manufacture and maintenance of machinery which form the basis of industrial production. Consequently, there is no other option but to organise training in these vital areas in Africa.

International NGOs like IITA should assist in this area which is today covered only by the African Regional Centre for Engineering Design and Manufacturing (ARCEDEM). Besides the re-adaptation of their programmes, universities should be organising practical training seminars for middle-level workers located within their areas or regions, at least.

II-4 Linkage between R and D activities and NGOs

A very low level of activity in research and development of the manufacturers affect the technological progress as well as design and adaptation of agricultural machinery and equipment in the African region. Except for the International Institute for Tropical Agriculture (IITA) which is directly involved in the testing and adaptation of a number of selected equipment, the role of international NGOs is limited to financing some research activities. This is an area where mainly international NGOs are present most of the time. Research and development programmes in the field of agricultural machinery are usually carried out by specialised public institutes under the auspices of the Ministry of Agriculture and/or Scientific Research. Except for the African Regional Centre for Engineering Design and Manufacturing (ARCEDEM) which is an Intergovernmental organisation, there is no sub-regional or regional organisation or association which deals with the design, adaptation, testing and manufacture of prototypes of agricultural machinery and equipment. As explained earlier, proper and effective linkages between R and D institutions, various industrial manufacturers and various national, sub-regional and regional NGOs are yet to be established.

The flow of information and prototype exchange is very limited. A single activity can be repeated in different neighbouring countries. Coordination of programmes does not exist and contacts between personnel, specialists and organisations are rare. Moreover, a majority of prototypes remain as they are

for the fact that (a) there is no link between R and D institutions, universities and manufacturers; (b) no finance to ensure the production of prototypes in pre-series, other factors being (c) the lack of competence in the field and (d) the absence of guarantee as far as viable markets are concerned. However, some adaptation of imported equipment has been carried out with the help of foreign experts showing the existence of possibilities at that level of potential technical cooperation. In the past, such programmes failed in some cases due to an incorrect understanding of internal administrative procedures. It is suggested that thorough analyses of past experiences in this area be made in order to promote and intensify development of local potential for technical studies and manufacturing processes.

II-5 Major problems faced by African NGOs in the development of agricultural machinery and possibilities of cooperation with international NGOs

The problems faced by national non-governmental organisations involved in the development of agricultural machinery and equipment include the following:

a. Most NGOs at national level lack adequate organisational structures and managerial abilities. There is no concrete move from these organisations in order to be involved in the economic development process. If we consider the example of professional associations of engineers, they often remain just forums of intellectualism or means of reference.

b. Local authorities do not usually pay proper attention to NGOs. This situation is created by the fact that the NGOs frequently behave just as trade unions which seek to obtain their rights but forget their orligations. As a consequence, they are hardly called upon to participate in planning the economy in general, and the development of agricultural machinery and equipment in particular.

c. In the 1979s, many governments embarked on the promotion of artisan associations and cooperatives in order to create dynamic networks for the production of agricultural machinery and equipment. However, after sometime, practically all of these were bound to face tremendous difficulties due to the following reasons:

- lack of managerial skills and technical knowledge;
- lack of relevant data on product design and manufacture;
- lack of funds;
- lack of organised markets.

d. Inadequate institutional framework to coordinate and regionalise activities of national NGOs and government institutions promoting such activities is also a bottleneck.

As explained in paragraphs 3 and 4 above, NGOs play a certain role in the development of agricultural machinery at national and international levels. To improve and strengthen this role, appropriate actions should be undertaken to promote cooperation between NGOs at national level on the one hand, and between national and international NGOs on the other hand. A possible approach to rationalise, coordinate and monitor cooperation between national NGOs will be discussed in the next paragraph.

The areas of possible cooperation between national and international NGOs can be grouped as follows:

R and D Activities: National and international NGOs could work together on the improvement of design and adaptation of farm machinery and equipment in order to satisfy the market requirements. Exchange of information on working drawings of farm machinery and equipment would be eventually developed for local manufacture either through small, medium or large-scale industries, whichever is more appropriate. Exchange of prototypes should be encouraged. These prototypes would be distributed to selected workshops/industries for adaptation after successful trial.

Manufacture: Joint ventures for the manufacture of selected agricultural equipment can be developed through cooperation with international NGOs. International NGOs seem to be interested in this area of cooperation. This approach may certainly help to overcome many of the bottlenecks hampering the development and manufacture of agric machinery and equipment in Africa.

Training: Assistance of international NGOs is required to help strengthen the capabilities in evaluation, design development and production of prototypes of equipment to suit local manufacturing conditions and markets. This cooperation can be in the form of establishment of pilot and demonstration units, especially for small and medium-scale production.

Studies and Surveys: Joint studies and surveys would be a good approach to allow complementarity and achieve more realistic results. Joint workshops/ seminars could be organised to initiate or conclude studies as well as debate on a specific item to be tackled, e.g. selection of raw material for a particular equipment or new economic production process, etc.

Exchange of Experience: Exchange of experience in management and organisation of NGOs involved in the development of agric equipment is also an important area which should not be neglected. Some regions are already having a substantial amount of experience in the organisation of cooperatives or associations working in this priority area for Africa. Their assistance in solving managerial and organisational problems in African NGOs as well as exchange of experience would be of great help.

III. Conclusions and Recommendations

Any activity to be carried out for the development of agricultural machinery and equipment in Africa, be it at national or international level, should be considered in line with the ongoing activities as stipulated in the Lagos Plan of Action and the programme of the Industrial Development Decade for Africa (IDDA).

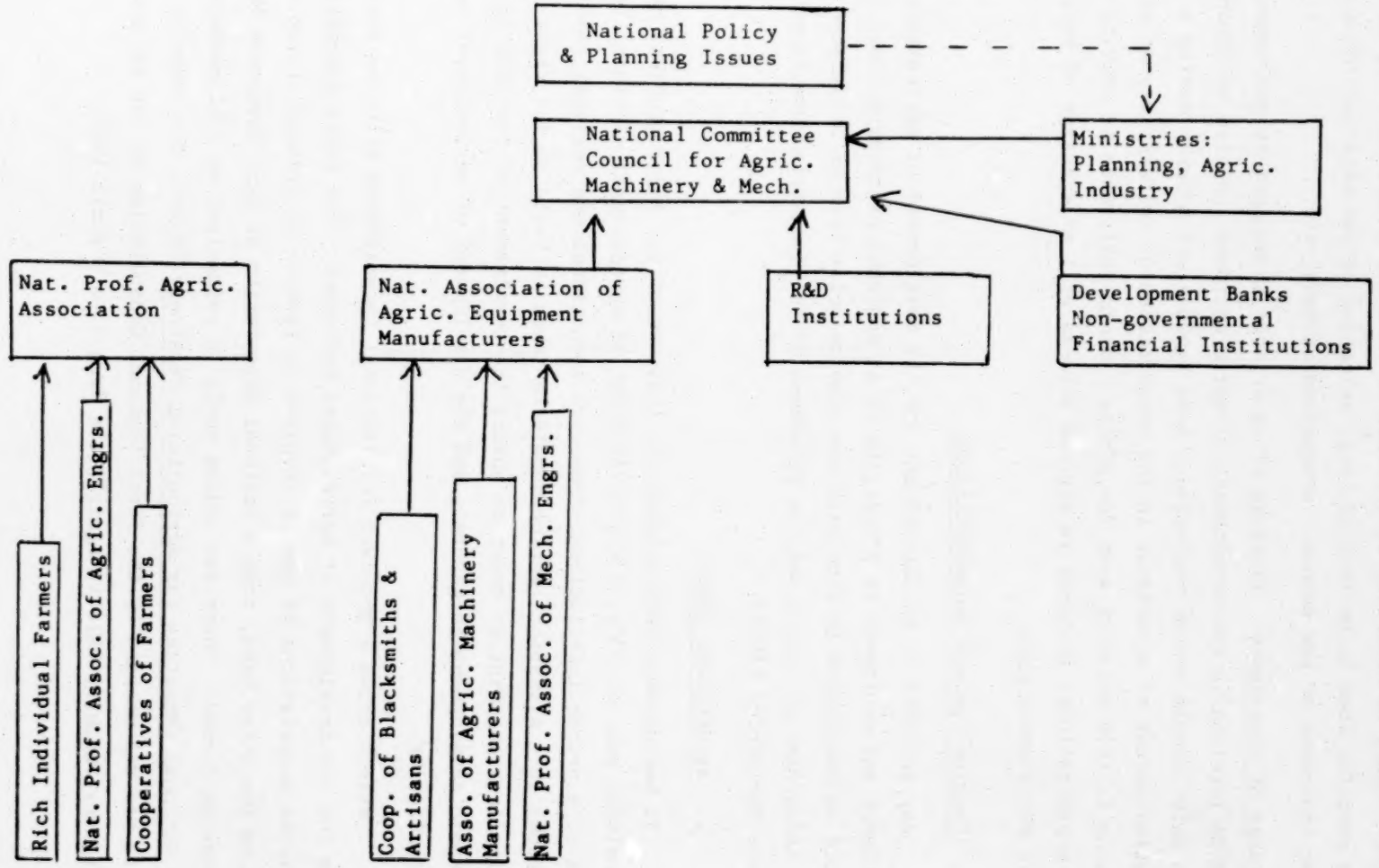
1. At National Level:

It has already been pointed out that one of the major problems hampering a positive role of NGOs in the development of agricultural machinery is the lack of a proper institutional framework at national and regional levels. To overcome this situation, action should be taken to build up the right institutional arrangement in order to ensure the involvement of the NGOs in the economic development in general, and the development of agricultural machinery in particular.

Table 4 shows a proposed institutional interlinkage with the national NGOs for the development of agricultural machinery. The chart suggests that national associations of people involved in farming be created on the one hand, and on the other hand, that a National Association of Agri Equipment Manufacturers be formed. These two bodies would be recognised as full members of the National Committee for Agricultural Machinery (NCAM), the creation of which was recommended by the first Regional Consultation on the agricultural machinery industry held in Addis Ababa from 5 to 9 April 1982.

Table 4

Proposed Institutional Interlinkage with the National NGOs for the Development of Agricultural Machinery and Equipment


National Policy & Planning Issues
National Committee Council for Agric. Machinery & Mech.
Ministries: Planning, Agric. Industry
Nat. Prof. Agric. Association
Nat. Association of Agric. Equipment Manufacturers
R&D Institutions
Development Banks Non-governmental Financial Institutions
Rich Individual Farmers
Nat. Prof. Assoc. of Agric. Engrs.
Cooperatives of Farmers
Coop. of Blacksmiths & Artisans
Asso. of Agric. Machinery Manufacturers
Nat. Prof. Assoc. of Mech. Engrs.

The farmer body will represent the customers while the latter represents the producers of agric machinery and equipment. R and D institutions, Development banks will also be represented in the NCAM. This will enable the NGOs to be involved in the policy planning process and consequently play a greater role. The decentralisation of implementation programmes will be carried out going down stream of the chart.

Governments should encourage NGOs to create these national bodies through adequate incentives and involve them fully in the planning process in order to allow them space to air out their invaluable views and opinions. Governments should also entrust national NGOs with responsibilities to carry out activities during the implementation of national plans as far as agricultural machinery is concerned.

2. By Regional Level:

Table 5 shows a proposed institutional interlinkage with regional NGOs for the development of agricultural machinery and equipment. National NGOs, regional research and development institutions and regional financial institutions will work under the framework of the Regional Committee/Council for Agricultural Machinery. Regional Committees/Councils (or networks as called in other regions) will work on regional policy and planning issues as far as agricultural machinery is concerned under the guidance and with the participation of the national ministries concerned for regional development institutions like ECOWAS, SADDAC, etc.

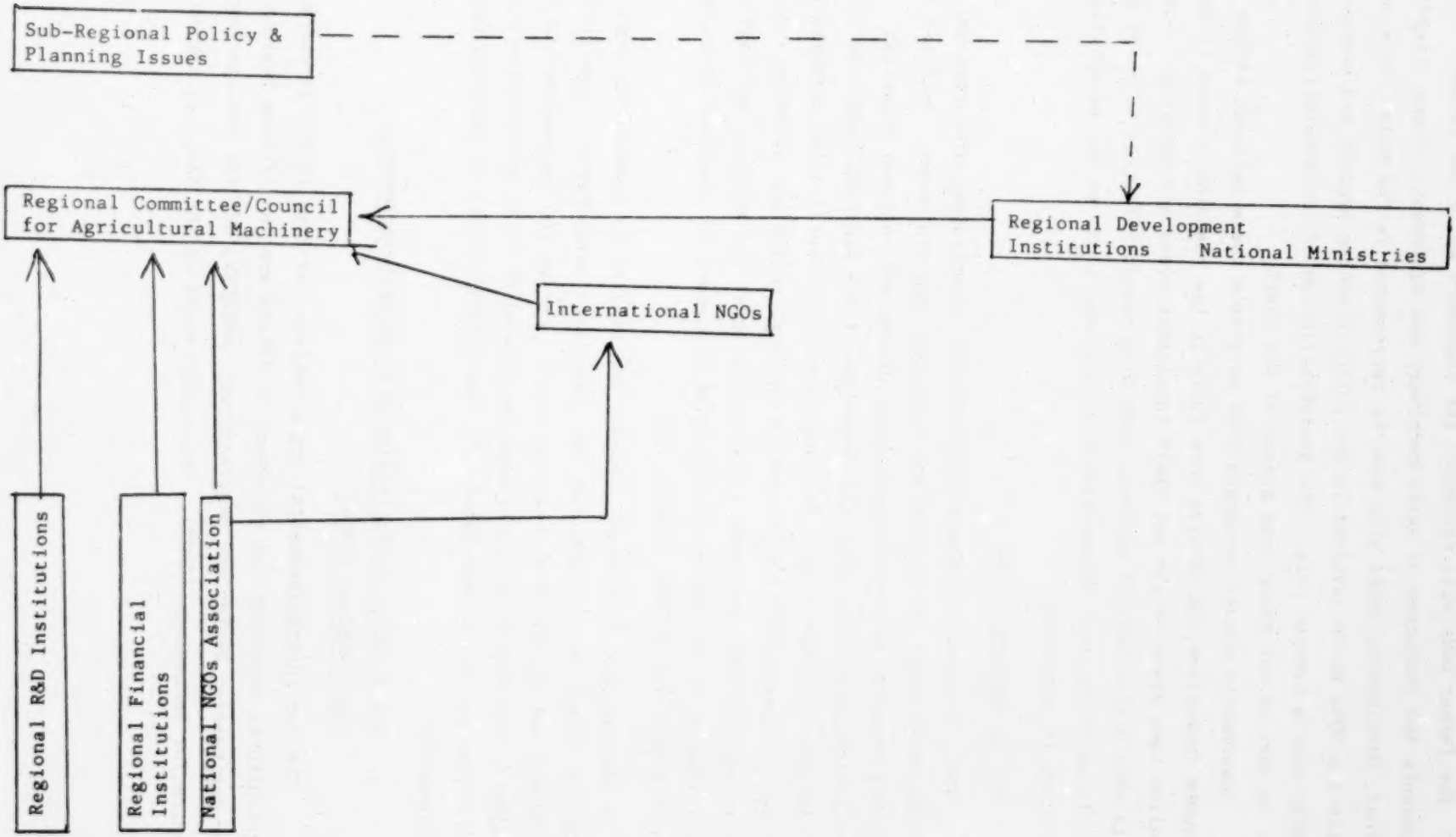
The Regional Committees, primary aim will be to promote regional projects with the objective of organising the integrated development of agricultural machinery and equipment at regional level. During the implementation phases of projects, regional NGOs should also be allowed to fully participate in planned activities and may be entrusted with the responsibility of carrying out concrete assignments.

3. Coordination of Activities with Inter-Governmental Organisations (IGOs)

The two intergovernmental organisations involved in the development of agricultural machinery and equipment in Africa are the African Regional Centre for Engineering Design and Manufacturing (ARCEDEM) and the African Regional Centre for Technology (ARCT). While ARCT works in the field of technology, i.e.

Table 5

Proposed Institutional Interlinkage with Regional NGOs for the Development of Agricultural Machinery



through the promotion of local technology and introduction/dissemination of adaptable frontier technology, ARCEDEM is entrusted with the responsibility of developing capabilities in machine design and manufacture, beginning with such priority areas as agricultural machinery and equipment.

The two institutions should promote cooperation with national associations of NGOs and assist through the supply of designs, dissemination of information, training, promotion of manufacture of accepted equipment, upgradation of workshops and promotion of entrepreneurs.

4. The Role of UNIDO

a. As explained above, NGOs at national level are in some countries fairly involved in the development of agricultural machinery, mainly through cooperatives or associations, e.g. COBEMAG in Benin, ARCOMA in Burkina Faso, and many others. It is suggested that UNIDO organise the assessment of this arrangement in order to liquidate the bottlenecks and promote this national networks in other countries where they do not exist.

b. UNIDO could also, in the selected countries, organise networks of small-scale industries at national level patronised by national associations of non-governmental organisations. This of course in the framework of an integrated national policy. In fact, countries like Nigeria and Ghana possess many of these small-scale industries. But lack of organised national structures is leading them to duplication and unnecessary competition on some equipment while others are ignored.

c. In the spirit of sub-regional integration, UNIDO should promote networks of agricultural machinery manufacture and in this process ascertain the full participation of NGOs both in the planning and implementation phases.

d. UNIDO should organise sub-regional meetings of NGOs involved in the manufacture and development of agricultural machinery in order to discuss specific problems facing those institutions and define potentials to be developed in order to stimulate and facilitate their participation in the overall process.

e. International Expert Group Meetings of NGOs from all regions will certainly help Africa to gain experience from the approaches adopted elsewhere. The impact of these meetings will be more felt if the meetings are specialized, for instance

- meeting of experts on animal-draw implements manufacture,
- meeting on post harvest processing equipment manufacture,
- meeting on hand tools manufacture, etc.

International NGOs could play a big role in such activities. It is suggested that UNIDO plans and organises these meetings, as well as work out specifically the role of well established international NGOs in the development of agricultural machinery and equipment in Africa.

BIBLIOGRAPHY

1. Agricultural machinery and rural equipment in Africa, A new approach to a growing crisis. UNIDO IS 377
2. Agricultural machinery and implements in Kenya ID/WG/418/8 E
3. Agricultural machinery and implements in Tanzania 27 pages ID/WG.418/7 E
4. Strengthening South-South business ties on agricultural machinery and rural energy. ID/WG/418.1 E
5. A survey of emperical studies in industrial manufacturing activities in the informal sector in the developing countries. 267 pages. UNIDO/IS.470 E
6. Report of the 7th Meeting of African Ministers of Industry. ID/CONF.5/28
7. A Programme for IDDA. ID/287
8. First and Second Consultation on the agricultural machinery industry; 45 pages. ID/307 E
9. Workshop on design and development of agricultural equipment in Africa. 28 pages, UNIDO/PC 55
10. Executive Director's Report 1983
11. A Programme for the IDDA ID/287
12. The IDDA Programme: review of progress, proposals and means to attain its objectives.
13. Handbook of industrial statistics 412 pages ID/284
14. Role of external assistance in African technological development: possibilities and limitations. ID/WG.332/8
15. Agriculture toward 2000 F.A.O.
16. Industrial Trade Statistics Almanach (N.Y.)
17. Lagos Plan of Action.